



Bartlett Services, Inc.

Decontamination of Transuranic Mixed Waste by the Sonatol® Process

Technology Need:

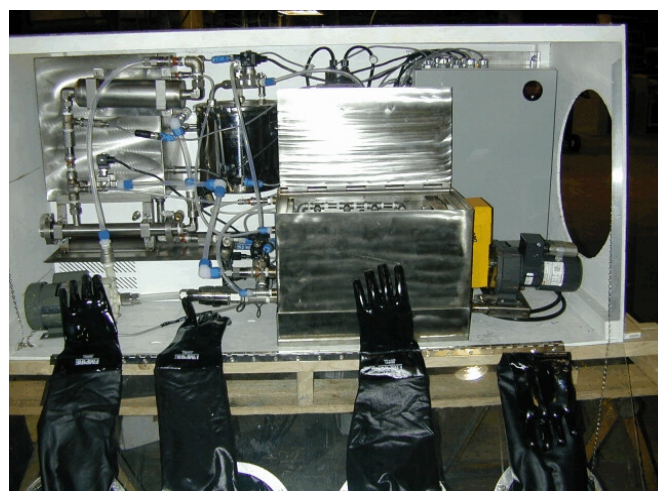
The Department of Energy's (DOE's) Savannah River Site (SRS) near Aiken, South Carolina, stores Pu-238 contaminated transuranic (TRU) waste. This waste may not be shippable to the Waste Isolation Pilot Plant (WIPP) in approved (TRUPACT-II) containers due to excessive generation of hydrogen gas as a result of radiolysis of organic constituents in the waste matrix. Treatment of this waste to destroy the organics (eliminating the source of hydrogen) would allow the waste to meet the TRUPACT-II hydrogen concentration limit of five percent. The alternative is decontaminate the organic matrix so that the Pu-238 can be concentrated in a WIPP-compliant package and the organic portion of the waste can be disposed as LLMW. The inorganic materials in the waste can also be processed to facilitate contamination control during repacking operations. Reclassification of the inorganic portion of the TRU waste to LLW or LLMW status is possible, but not necessary to satisfy the objective. Reclassification of inorganic materials would be at the option of each DOE site.

Technology Description:

The Bartlett Services, Inc. (BSI) Sonatol® process decontaminates surfaces by putting fluorinated surfactant solutions in contact with small radioactive particles on the surfaces of solid materials. Agitation and rinsing detaches the particles, which are then removed by filtration. The filters are disposed as TRU waste. The fluorinated solutions do not damage or affect the solid materials. BSI proposes a specially designed cleaning system with three detachment options: spray, mechanical agitation, and ultrasonic agitation. The cleaning chamber will have the ability to spray a hot detergent solution or a rinse solution onto contaminated items, while circulating the cleaning fluid

through 0.2 μm ceramic filters. The chamber will also be equipped to mechanically agitate the material in the chamber in a hot detergent solution or a rinse solution while circulating the cleaning fluid through 0.2 μm ceramic filters. The trilogy will be completed by equipping the chamber with an ultrasonic transducer so that the materials can be ultrasonically agitated in a hot detergent solution or a rinse solution while circulating the fluid through 0.2 μm ceramic filters.

A pass-through cleaning chamber design, inlet and outlet glove boxes, as well as extensive HEPA ventilation, will ensure contamination control during loading and repackaging activities. Loading operations will use special venting, fixative sprays, and glove bags inside glove boxes to control Pu-238. The bag out process will employ microwave melting of twisted bag liners and hot wire cutting at the twist to control contamination. There are no liquid or gaseous effluents. The 0.2 μm ceramic filters have no organic constituents. Similar filters have been approved for disposal at the Waste Isolation Pilot Plant (WIPP).



Benefits:

- ▶Removes sub-micron TRU particulate contaminants from solid substrates.
- ▶Treats heterogeneous waste streams, including debris, job control wastes, and clothing.
- ▶Simple, safe, highly automated decontamination process.
- ▶Sonatol® system could process 1 ft³/hr of legacy TRU waste at less than 10% of the cost of chemical processing.
- ▶No toxic or oxidizing chemicals are used; no high pressure or temperature needed for processing.
- ▶Lowered risk for impact to the environment: no gaseous effluent containing Pu-238 particles.
- ▶Most secondary waste can be decontaminated to LLMW in the Sonatol® system.
- ▶Reduced danger of high wattage Pu-238 accumulations in the processing system.
- ▶Pu-238 collected in ceramic filters; filter canister certified for disposal at WIPP; canister fits in 55-gallon drum for shipment.

Status and Accomplishments:

The project was initiated in September 2001. Bartlett has designed, fabricated and performed cold demonstration of the Sonatol® system. Three compositions of surrogate waste materials were tested with two decontamination protocols. The two protocols differed in that Protocol One employed one continuous period of ultrasonic agitation. Protocol Two added a cleaning chamber drain/fill cycle between two periods of ultrasonic agitation. In general, all the individual parts subjected to the trials appeared as clean as they were prior to contamination, or even cleaner in the case of industrial parts such as pipe fittings and fasteners. These preliminary results indicate that high levels of decontamination are achieved with both protocols and

carrying out two sonications, with an intermediate liquid drain/fill operation, may result in somewhat better decontamination than with a single liquid fill and drain. The organic fraction is decontaminated nearly as effectively as the inorganic fraction.

The work completed has resulted in optimized process parameters for surrogate SRS waste streams and in the design and fabrication of a small scale plant for the treatment of actual SRS wastes.

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Online Resources:

Office of Science and Technology, Technology Management System (TMS), Tech ID # 3164
<http://ost.em.doe.gov/tms>

The National Energy Technology Laboratory Internet address is <http://www.netl.doe.gov>

The Bartlett Services, Inc. Internet address is <http://www.bartlettinc.com>